also reserve the right to invoke rejoinder of the unelected claims of Groups II under M.P.E.P. § 821.04, should the claims of Group I be found to include allowable subject matter.

§112

Applicants' claims 1, 2, 9 and 10 have been rejected under §112 due to the use of the phrase "absorption of about 45 or less". M.P.E.P. §2173.05(b) states that relative terminology does not automatically render a claim indefinite. Applicants assert that the use of the term "about" is not indefinite, and respectfully request reconsideration of these claims.

The phrase "vinyl substituted aromatic" as used in claim 4 has also been rejected under §112 for indefiniteness. Applicants wish to clarify that this phrase refers to an aromatic group with a vinyl group attached thereto. Applicants believe that this phrase is not indefinite, and therefore request reconsideration of such claim.

§102(b)

The USPTO has rejected the present application under 35 U.S.C. §102(b) as anticipated by LAUBE (US 5,426,147) in view of evidence in KITAHARA (US 4,525,541). In the Office Action, LAUBE is described as disclosing "rubber composition used in tire inner liners comprising large sized carbon black and rubber among other conventional additives." The Office Action includes the statement that the prior art of LAUBE discloses a different part of the tire made from the prior art composition, but that one of ordinary skill in the art would also know that other parts such as bead filler could also be made form the same composition as evidenced in KITAHARA.

In order for a claim to be anticipated, each and every element of the claim must be described, either expressly or inherently, in a single prior art reference. (M.P.E.P. §2131, quoting from *Verdegaal Bros. v. Union Oil Co. of California,* 814 F.2d 628, 621 (Fed. Cir. 1987)). "Normally, only one reference should be used in making a rejection under 35 U.S.C. 102" (M.P.E.P. §2131.01). However, §102 rejections over multiple references have been appropriate when the extra reference is used to: 1) prove the primary reference contains an "enabled disclosure", 2) Explain the meaning

of a term used in the primary reference; or 3) Show that a characteristic not disclosed in the reference is inherent (M.P.E.P. §2131.01).

Applicants' claims 1-15 are rejected under §102(b) in light of LAUBE. LAUBE is directed to "rubber compositions which exhibit a combination of reduced permeability to gases and suitable physical properties" (col 1, lines 51-53). LAUBE does not identify the bead area of the tire as an application for the rubber compositions disclosed therein. Therefore, because LAUBE does not expressly or inherently disclose every element of Applicants' claims, LAUBE should not be considered to anticipate these claims.

The KITAHARA reference should not be considered evidence of the fact that rubber compositions can be used interchangeably among tire components. This is not an inherent characteristic of the invention disclosed and claimed in LAUBE, and therefore KITAHARA does not fit within any of the three situations described in M.P.E.P. §2131.01. Additionally, the portion of KITAHARA identified as supporting the contention that a tire innerliner composition can be used as a bead filler composition is actually directed to rubber compositions containing the *modified rubber (polymer)* of KITAHARA. This statement in no way supports the use of a tire innerliner composition as a tire bead filler composition.

The innerliner and bead filler components serve very different purposes within the tire. The tire innerliner formulation commonly includes halogenated butyl rubber to provide "good air retention and moisture impermeability, flex-fatigue resistance and durability (*Rubber Technology*, Dick, John, 2001, p. 339). Whereas the bead filler is desirably a "high quality flexible heat resistant stock" (*Vanderbilt Rubber Handbook*, 1968, p.447). The differences among rubber tire components is exemplified in the table from the Vanderbilt Rubber Handbook, 13th ed., pp. 416-419 (previously submitted). This table identifies different grades of carbon black and applications therefore, including tire applications. Noticeably, the different grades of carbon black are identified as having differing applications within the tire. This supports Applicants' assertion that rubber compositions cannot necessarily be used interchangeably within the tire.

Conclusion

Applicants respectfully request reconsideration of the pending claims. If there is any matter that requires further attention from Applicants, the Examiner is invited to contact the Undersigned by telephone.

Respectfully Submitted By:

29 January 2004
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Rubber Technology

Compounding and Testing for Performance

Edited by

John S. Dick

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Adhesive and physical properties were further improved by using diphenylguanidine as the co-accelerator. High levels of silane-coupled silica yielded compounds with the highest tear strength and heat- and salt-aged adhesion values.

13.5.5 Innerliner

The innerliner is a thin layer of rubber laminated to the inside of a tubeless tire to ensure retention of compressed air. It is most commonly formulated with HIIR to provide good air retention and moisture impermeability, flex-fatigue resistance, and durability [23,25]. Clay has been the predominant non-black filler in innerliner compounds [8] (see Table 13.6). Use of calcium carbonate [33], talc, and mica [34] have been reported in multilayered

Table 13.6 Tire Innerliner Compounds

Ingredient	Control (0/50 phr)	Clay (72/0)	Clay/Black (39.7/27.5)	Clay/Black (47/32.5)
Bromobutyl rubber, 2244	100.00	100.00	0.00	0 phr
Bromobutyl rubber, MD 80-7	0.00	0.00	100.00	100.00
Carbon black, N660	50.00	0.00	27.50	32.50
Clay, Nulok 321	0.00	72.00	39.70	47.00
Flexon 621	8.00	8.00	8.00	6.00
Struktol 40 MS	7.00	7.00	7.00	6.00
Escorez 1102	4.00	4.00	6.00	5.00
Maglite K	0.25	0.25	0.25	0.15
Stearic acid	2.00	2.00	2.00	2.00
Zinc oxide	3.00	3.00	3.00	3.00
MBTS	1.50	1.50	1.50	1.50
Sulfur	0.50	0.50	0.50	0.50
Properties, cured at 150 °C				
Modulus at 100%, kg/cm^3	9.10	9.10	9.10	14.30
Modulus at 300%, kg/cm^3	30.00	36.00	30.00	38.00
Tensile, kg/cm^3	112.00	112.00	102.00	102.00
Elongation, %	870.00	870.00	900.00	900.00
Hardness, Shore A	50.00	43.00	48.00	53.00
[illegible] Tear, kg/cm	21.00	11.00	18.00	23.00
[illegible]				
Self, kg/cm^3	125.00	101.00	87.00	91.00
NR Carcass, kg/cm^3	30.00	30.00	47.00	37.00
[illegible] adhesion to natural rubber ([illegible] Interfacial, T = Tearing)				
[illegible] temp, kg/cm^3	24 I	22 T	27 T	25 T
[illegible], kg/cm^3	21 T	9 I	11 I	16.2 T
[illegible] growth, 66 °C, cm at 24 h	1.50	1.19	0.60	0.60
[illegible] failure	2.00	4.00	>10.00	>13.00
[illegible] meability, 66 °C, $\times 10^{-2}$	3.30	2.20	–	2.20
[illegible] scorch at 135 °C	9.00	12.00	20.00	17.00
[illegible] viscosity at 135 °C	60.00	47.00	43.00	45.00

[illegible] is a registered trademark of J. M. Huber, Inc.

innerliners. Clay, silica, and talc have been found in the innerliner compounds of various passenger tires based upon direct analysis of the liner by using proton-induced X-ray emission spectroscopy [35].

13.5.6 Tread

The tread is the wear-resistant component of a tire that comes in contact with the road. It is designed for abrasion resistance, traction, speed stability, and casing protection [23]. The rubber is compounded for wear, traction, rolling-resistance, and durability [25]. Clay and silica are used in colored bicycle tire treads [36]. Silica is beneficial in NR off-the-road tire treads [36] (see Table 13.7) and in SBR agricultural tire treads [37] to reduce heat build-up and cut growth.

A NR heavy-service truck tire tread with 30 phr silica and mercaptosilane coupling agent (1% by weight of the silica weight) as a replacement for N231 black showed increased resistance to cutting and chipping [38]. Higher levels of silica could be used without a significant sacrifice in heat build-up and treadwear by using the coupling agent. Rolling resistance was reduced by 30%, wet traction was virtually unchanged, and the treadwear index was decreased only by 5% when TESPT-modified silica was used to replace all of the N220 carbon black in a NR truck tread [39].

The rolling resistance of an SBR/BR passenger tire tread was reduced 25% without substantial loss in wet or dry traction by using up to 36 phr of silica and mercaptosilane coupling agent (3% of silica) in a 72 phr filler system [40] (see Table 13.8). Use of TESPT afforded an equilibrium cure in a 20 phr silica and 40 phr N339 black tread. Lower rolling resistance with negligible changes in treadwear and wet traction was obtained [41].

Table 13.7 Off-the-Road Tire Tread Compounds

Ingredients	Control	Silicas #1	#2
Natural rubber, SMR-5	100.00	100.00	60.00 phr
Styrene-butadiene rubber, 1500	0.00	0.00	40.00
Carbon black, N330	50.00	40.00	40.00
Precipitated silica, Hi-Sil 233	0.00	10.00	10.00
Sulfur	2.50	2.50	1.50
Accelerator, MBS	0.80	1.50	1.50
Accelerator, DTDM	0.00	0.00	0.60
Properties			
Mooney Scorch at 121 °C			
min to 5 pt rise	27.60	28.00	40.50
Modulus at 300%, 2 h cure			
at 127 °C, MPa	13.62	12.96	12.41
Trouser tear, N	8.90	6.20	34.70
Goodrich Flexometer, 17.5% deflection, 1.55 MPa load, 100 °C, 30 min			
Δ T, °C	26.00	18.00	25.00
% Set	11.90	9.10	9.60
Chipping/chunking resistance, blows to fail	328.00	402.00	493.00
Pico Abrasion Index	171.00	187.00	185.00

Hi-Sil is a registered trademark of PPG Industries, Inc.

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PNEUMATIC TIRE COMPONENTS AND COMPOUND REQUIREMENTS

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A modern pneumatic tire structure can be broken down into the following basic parts:

Beads. The bead is a combination of multi-strand high tensile steel wire, rubber insulation, fabric, wrapping, and flipper strips—these forming the ring shaped unit that is installed as the "bead" in tire building. A suitable term for this portion of the tire, including this bead and the surrounding rubber and fabric, would be "beaded edge". The chief job of this "beaded edge" in a modern tire is to hold the casing on the rim by preventing the "beaded edges" from stretching. Without the wire, pressure of the air inside the tire would cause the edges of the casing to stretch until they slipped over the rim flanges. Obviously such a tire would be worthless. The bead provides a fairly rigid, practically inextensible foundation supporting the tire load, and, in turn, transferring this load to the flange edges of the rim. Compounds used in bead construction are:

1. Bead Insulation. Its function is to adhere to the wire, give the finished bead the desired degree of rigidity and flexibility, and to insulate one steel strand from another.

2. Bead Cover and Wrap. The compound used on the bead cover or wrap must have sufficient tack to insure good adhesion during assembly and cure, good flexibility after cure, and high heat resistance.

3. Bead Filler. In passenger tires the bundle of wires is small and there is sufficient stock and stock flow during cure that it is not necessary to use a bead filler. In truck tires and tires with extremely large beads it is necessary to provide stock in addition to that insulating the wires and on the bead cover and wrap, to obtain a proper contour. This is usually a wedge shaped extrusion which is placed on top of the bead bundle before wrapping and should be a high quality flexible heat resistant stock.

Body. The body of a pneumatic tire contains the following components:

1. Plies. The plies form the skeletal component from which the tire obtains its strength. This may be cotton, rayon, nylon, polyester, glass fiber, wire or any other material, which in the form of a strand or woven into a cord, has extremely high tensile strength and flexibility, and can